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**DEPARTMENT OF THE ARMY**
**U.S. ARMY CORPS OF ENGINEERS**

**RST-08810R (March 2002**
**----------**
**Superseding**
**RST-RST-08810R (August 2000)**
**CEGS-08810 (May 1997)**
**CEGS-08810 (December 1993)**

**GUIDE SPECIFICATION FOR CONSTRUCTION**

**Specification revised to meet U.S. Army Reserve requirements August 2000**
**Includes changes through Notice 4 (May 2000)**
**Includes Special Change (Tailoring Options) (July 1998)**
**Includes Text Adjustment Change (October 1999)**
**Includes Special Change (Submittal Paragraph)(June 2000)**

**Latest change indicated by CHG tags**

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DIVISION 08 - DOORS & WINDOWS

SECTION 08810R

GLASS AND GLAZING

**03/02**

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SECTION 08810R

GLASS AND GLAZING
**03/02**

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**NOTE: This guide specification covers the requirements for flat glass; annealed, heat-absorbing, light-reducing, patterned, wired, architectural laminated, solar-reflective, low-E, tempered, heat-strengthened, spandrels, fire/safety rated, mirrors, and control tower glass. This guide specification is to be used in the preparation of project specifications in accordance with ER 1110-1-8155.**

**Comments and suggestions on this guide specification are welcome and should be directed to the proponent of the specification. A listing of proponents, including their organization designation and telephone number, is at URL http://www.hnd.usace.army.mil/techinfo/index.htm, and an electronic feedback page for submission of recommended changes is available at the same address. Use of electronic communication is encouraged.**

**NOTE: RST-07530 is a Louisville District Army Reserve Support Team (RST) version of CEGS-08810. Any text changed by the RST is underlined. Refer all specification comments to the RST.**

**This guide specification includes tailoring options for laminated glass, spandrel glass, fire/safety rated glass, mirrors, and control tower glass. Selection or deselection of a tailoring option will include or exclude that option in the section, but editing the resulting section to fit the project is still required.**

**********

PART 1 GENERAL

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**NOTE: The Corps of Engineers, TI 800-01 DESIGN CRITERIA, should be reviewed to determine the requirements of glazing.**

**********

1.1 REFERENCES

**********

**NOTE: Issue (date) of references included in project specifications need not be more current than provided by the latest change (Notice) to this guide specification.**

**********

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

| | |
|---|---|
| ANSI Z97.1 | (1984; R 1994) Safety Performance Specifications and Methods of Test for Safety Glazing Materials Used in Buildings |

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

| | |
|---|---|
| ASTM C 509 | (1994) Elastomeric Cellular Preformed Gasket and Sealing Material |
| ASTM C 669 | (1995) Glazing Compounds for Back Bedding and Face Glazing of Metal Sash |
| ASTM C 864 | (1999) Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers |
| ASTM C 920 | (1998) Elastomeric Joint Sealants |
| ASTM C 1036 | (1991; R 1997) Flat Glass |
| ASTM C 1048 | (1997b) Heat-Treated Flat Glass - Kind HS, Kind FT Coated and Uncoated Glass |

| | |
|---|---|
| ASTM C 1172 | (1996el) Laminated Architectural Flat Glass |
| ASTM C 1349 | (1996) Architectural Flat Glass Clad Polycarbonate |
| ASTM D 395 | (1998) Rubber Property - Compression Set |
| ASTM E 119 | (1998) Fire Tests of Building Construction and Materials |
| ASTM E 773 | (1997) Accelerated Weathering of Sealed Insulating Glass Units |
| ASTM E 774 | (1997) Classification of the Durability of Sealed Insulating Glass Units |
| ASTM E 1300 | (1998) Determining the Minimum Thickness and Type of Glass Required to Resist a Specified Load |

AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)

| | |
|---|---|
| ASCE 7 | (1995) Minimum Design Loads for Buildings and Other Structures |

CODE OF FEDERAL REGULATIONS (CFR)

| | |
|---|---|
| 16 CFR 1201 | Safety Standard for Architectural Glazing Materials |

COMMERCIAL ITEM DESCRIPTION (CID)

| | |
|---|---|
| CID A-A-378 | (Basic) Putty Linseed Oil Type, (for Wood-Sash-Glazing) |

GLASS ASSOCIATION OF NORTH AMERICA (GANA)

| | |
|---|---|
| GANA Glazing Manual | (1997) Glazing Manual |
| GANA Standards Manual | (1995) Engineering Standards Manual |

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

| | |
|---|---|
| NFPA 80 | (1999) Fire Doors and Fire Windows |
| NFPA 252 | (1995) Fire Tests of Door Assemblies |
| NFPA 257 | (1996) Fire Tests for Window and Glass Block Assemblies |

1.2 SUBMITTALS

**********

**NOTE: Submittals must be limited to those necessary for adequate quality control. The importance of an item in the project should be one of the primary factors in determining if a submittal for the item should be required.**

**Indicate submittal classification in the blank space following the name of the item requiring the submittal by using "G" when the submittal requires Government approval. Submittals not classified as "G" will show on the submittal register as "Information Only". For submittals requiring Government approval, a code of up to three characters should be used following the "G" designation to indicate the approving authority; codes of "RE" for Resident Engineer approval, "ED" for Engineering approval, and "AE" for Architect-Engineer approval are recommended.**

**********

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Glazing Materials and Accessories; FIO

Drawings showing complete details of the proposed setting methods, mullion details, edge blocking, size of openings, frame details, materials, and types and thickness of glass.

SD-03 Product Data

Glass; FIO. Glazing Accessories; FIO

Manufacturer's descriptive product data, handling and storage recommendations, installation instructions, and cleaning instructions.

SD-04 Samples

Glass; FIO

Two 203 x 254 mm 8 x 10 inch samples of the following: insulating glass units. Color shall be in accordance with Section 09915 COLOR SCHEDULE

SD-07 Certificates

Glass; FIO

Certificates stating that the glass meets the specified requirements. Labels or manufacturers marking affixed to the glass will be accepted in lieu of certificates.

1.3 SYSTEM DESCRIPTION

Glazing systems shall be fabricated and installed watertight and airtight to withstand thermal movement and wind loading without glass breakage, gasket failure, deterioration of glazing accessories, and defects in the work. Glazed panels shall comply with the safety standards, as indicated in accordance with ANSI Z97.1. Glazed panels shall comply with indicated wind/snow loading in accordance with ASTM E 1300.

1.4 DELIVERY, STORAGE AND HANDLING

Glazing compounds shall be delivered to the site in the manufacturer's unopened containers. Glass shall be stored indoors in a safe, well ventilated dry location in accordance with manufacturer's instructions, and shall not be unpacked until needed for installation. Glass shall not be stored on site over 1 month.

1.5 PROJECT/SITE CONDITIONS

Glazing work shall not be started until outdoor temperature is above 5 degrees C 40 degrees F and rising, unless procedures recommended by glass manufacturer and approved by Contracting Officer are made to warm the glass and rabbet surfaces. Ventilation shall be provided to prevent condensation of moisture on glazing work during installation. Glazing work shall not be performed during damp or raining weather.

1.6 WARRANTY

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**NOTE: Add or delete warranty requirements as required to meet project requirements.**

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1.6.1 Insulating Glass

Manufacturer shall warrant the insulating glass to be free of fogging or film formation on the internal glass surfaces caused by failure of the hermetic seal for a period of 10 years from Date of Substantial Completion. Warranty shall be signed by manufacturer.

PART 2 PRODUCTS

**********

**NOTE: Locations and types of all glass, size of glazed openings, and frame details indicating method of glazing shall be shown on drawings. Glass thickness shall be shown on drawings.**

**It is critical that skylights be maintainable. Designer must include skylight access devices as a part of the design package where skylights are large**

**or at great heights above floor.**

**Glazed openings other than glazed panels that are located in areas subject to accidental human impact shall be glazed with safety glass conforming to 16 CFR 1201, SAFETY STANDARD FOR ARCHITECTURAL GLAZING MATERIALS. Within the context of this specification, 16 CFR 1201 establishes two categories of products as follows:**

**1. Category I Products: Doors and glazed panels that contain single piece of glazing material no greater than 0.84 m2 (9 ft2) in area. The product must be capable of withstanding 203 Nm (150 foot pound) impact load test.**

**2. Category II Products: Doors and glazed panels that contain any single piece of glazing material greater than 0.84 m2 (9 ft2) in area. The product must be capable of withstanding a 542 Nm (400-foot-pound) impact load test. Category II products may be used in both Category I and Category II situations.**

**3. Doors: 16 CFR 1201 applies to all types of interior doors and exterior doors, including storm doors and combination doors. Safety glass is not required for openings in doors through which a 76 mm (3 inch) diameter sphere is unable to pass. Glazing for fire doors shall be in accordance with NFPA 80, even though this may be at variance with requirements of 16 CFR 1201.**

**4. Glazed Panels: 16 CFR 1201 no longer applies to exterior and interior glazed panels. Glazed panels shall conform to ANSI Z97.1, SAFETY PERFORMANCE SPECIFICATION AND METHODS OF TEST FOR SAFETY GLAZING MATERIALS USED IN BUILDINGS. Since glazed panels may be hazardous, safety glazing should be generally provided as described below:**

**a) Glazed panels of any size located adjacent to a doorway, with the nearest vertical edge of panel within 1219 mm (48 inches) of doorway, and with bottom edge of panel below top of door. Safety glazing is not required for panels separated from the doorway by an intervening interior permanent wall.**

**b) Glazed panels with a surface area greater than 0.84 m2 (9 ft2) where there is a walking surface on either side of panel, and the walking surface is within 914 mm (36 inches) of the panel. Safety glazing is not required if the lowest edge of the**

**glazing material is 457 mm (18 inches) or more above both walking surfaces, or if the panels have a horizontal member, such as a mullion or permanent railing not less than 38 mm (1-1/2 inches) in width, capable of withstanding a horizontal load of 75 kg/m (50 plf), on the accessible sides of the glazing and located between 609 mm and 914 mm (24 and 36 inches) above the walking surface.**

**c) Where insulating glass units are used in locations requiring safety glazing, both panes shall be safety glass.**

**d) For exterior applications, safety glazing must also meet the wind and snow load requirements in accordance with ASTM E 1300.**

**e) In general, any glazed area subject to human impact should be provided with safety glazing or other acceptable protective devices such as handrails or horizontal mullions.**

**ASTM C 1036 covers the quality requirements for clear annealed glass, transparent tinted heat-absorbing and light-reducing glass, patterned and wired glass with a series of classification designations such as Types, Classes, Styles, Forms, Qualities, Finishes, and Intended Uses, as defined below:**

**1. Type designations are: Type 1 - Transparent Flat Glass; Type II - Patterned and Wired Glass.**

**2. Class designations are: Class 1-clear; Class 2-tinted Heat-Absorbing and Light-Reducing; Class 3-tinted, light-reducing.**

**3. Style designations are: Style A - Higher light transmittance; Style B - Lower light transmittance.**

**4. Form designations are: Form 1 - Wired polished both sides; Form 2 - Patterned and wired, Form 3 - Patterned.**

**5. Quality designations including intended uses for ASTM C 1036 transparent flat glass are:**

**a) Quality q1 - Mirror Select Quality: Coated for premium mirrors.**

**b) Quality q2 - Mirror: Coated for general use mirrors.**

**c) Quality q3 - Glazing Select: For architectural**

**fenestrations or other applications where distant objects are viewed through the glass by the observer.**

**6. Quality designations and intended uses for Patterned and Wired Flat Glasses:**

**a) Quality q7 - Decorative: For use where design and aesthetic characteristics are major considerations.**

**b) Quality q8 - Glazing: For general glazing where functional or aesthetic characteristics are a consideration and where surface blemishes are not a major concern.**

**c) Wired Glass: For skylights and general glazing where fire retardation or glass retention in a frame are a consideration.**

**********

2.1 FLOAT GLASS

2.1.3 Tinted (Light-Reducing) Glass

Tinted (light-reducing) glass shall be Type I transparent flat type, Class 3-tinted, Quality q3 - glazing select, [_____] percent light transmittance, [_____] percent shading coefficient, conforming to ASTM C 1036. Color shall be [[gray] [bronze] [_____]] [as shown in Section 09915 COLOR SCHEDULE].

2.2 ROLLED GLASS

2.2.2 Wired Glass

**********

**NOTE: Types of wired glass available are polished, patterned, and tinted/heat-absorbing wired glass. Wired glass cannot be tempered. Wired Glass does not meet the requirements of 16 CFR 1201 and cannot be used as safety glazing materials in situations governed by that regulation.**

**Typically 6 mm (1/4 inch) thick wired glass is used for fire-rated windows and doors where required by building codes and other fire-protection criteria.**

**Only wire glass in Mesh 1 - Diamond and Mesh 2 - Square are acceptable for fire rated door and window openings. Mesh 3 - Parallel is not acceptable for fire rated openings.**

**Wired glass, because of the wire mesh and edge damage from cutting, is very susceptible to thermal breakage. Heat absorbing wired glass increases the**

**tendency for breakage. Wired glass is also susceptible to edge breakage from water penetrating the capillary in which the wires reside. The glazing system should insure that the edges are kept dry by sealing the edges with silicone.**

**********

Wired glass shall be 6mm minimum thickness Type II flat type, Class 1 - translucent, Quality q8 - glazing, Form 1 - wired and polished both sides. Wire mesh shall be polished stainless steel Mesh 1 - diamond. Wired glass for fire-rated windows shall bear an identifying UL label or the label of a nationally recognized testing agency, and shall be rated for 45 minutes when tested in accordance with NFPA 257. Wired glass for fire-rated doors shall be tested as part of a door assembly in accordance with NFPA 252.

2.3 INSULATING GLASS

**********

**NOTE: Insulating glass units may be used when authorized by the TI 800-01 design criteria to reduce heat loss or heat gain through the glass. Refer to GANA GLAZING MANUAL, Insulating Glass Performance Tables, for proper selection of glass performance and color.**

**********

Insulating glass shall be Class a preassembled units of dual-seal construction consisting of lites of glass separated by an aluminum, steel, or stainless steel, spacer and dehydrated space conforming to ASTM E 773 and ASTM E 774. Spacer shall be roll-formed, with bent ot tightly welded or keyed and sealed joints to completely seal the spacer periphery and eliminate moisture and hydrocarbon vapor transmission into airspace through the corners. Primary seal shall be compressed polyisobutylene and the secondary seal shall be a specially formulated silicone.

2.3.4 Low-E Laminated Insulating Glass

**********

**NOTE: Coordinate with paragraph Reflective Insulating Glass. All glass on the exterior of Army Reserve facilities should consist of low e laminated insulating glass. The laminated glass is necessary to comply with the minimum DoD Antiterrorism/Force Protection Construction Standards. K values shall depend on the tint color selected.**

**********

Exterior pane shall consist of tinted, tempered glass and the interior pane shall consist of laminated glass with anti-reflective low-emissivity coating on No. 2 surface (inside surface of exterior pane). Glass performance shall be K-Value/Winter Nighttime [_____] R-Value/Winter Nighttime [_____], shading coefficient [_____]. Color shall be as shown in Section 09915 COLOR SCHEDULE.

## 2.5 HEAT-TREATED GLASS

**********

**NOTE: ASTM C 1048 covers the quality requirements for flat heat-strengthened, flat fully tempered coated and uncoated glass with a series of classification designations such as Kinds, Conditions, Types, Classes, Styles, Forms, Qualities, Finishes and Intended Uses defined as follows:**

**1. Kind HS, Types I and II: Heat-strengthened glass for general glazing where additional strength is desired but not requiring the strength of fully tempered glass.**

**2. Kind FT, Types I and II: Fully tempered glass for general glazing and safety glazing such as sliding doors, storm doors, building entrances, bath and shower enclosures, counter tops, showcases, interior partitions, and other uses where superior strength characteristics and safety properties of fully tempered glass are required.**

**********

Heat-treated glass shall conform to the following requirements.

### 2.5.1 Tempered Glass

**********

**NOTE: Tempered glass may be used where safety glass is required by 16 CFR 1201. Tempered Glass meeting ASTM C 1048 must also meet ANSI Z97.1 requirements to qualify as a safety glazing material. Refer to ASTM C 1048 to establish classification and quality of glass, and refer to manufacturer's data for performance evaluation and color selection. Tempered glass is available in thicknesses 3 mm to 19 mm (1/8 to 3/4 inch).**

**********

Tempered glass shall be 6mm minimum thickness kind FT fully tempered transparent flat type, Class 1-clear for interior applications and 2-tinted for exterior windows and vertibules, Condition A uncoated surface, Quality q3 - glazing select, conforming to ASTM C 1048 and GANA Standards Manual. Color shall be as shown in Section 09915 COLOR SCHEDULE.

### 2.5.2 Heat-Strengthened Glass

**********

**NOTE: Heat-strengthened glass may be used for facilities with spandrels, atriums, solariums, skylights and where climates and/or shading may require the glass to be heat-strengthened.**

**Heat-strengthened glass is not a safety glazing material and should not be used where human impact is a concern or where codes require safety glazing. Heat-strengthened glass can be made suitable for safety glazing applications by laminating.**

**********

Heat-strengthened glass shall be kind HS heat-strengthened transparent flat type, Class 1-clear, Condition A uncoated surface, Quality q3 - glazing select, conforming to ASTM C 1048.

## 2.6 LAMINATED GLAZINGS

### 2.6.1 Laminated Glass

**********

**NOTE: Laminated glass can be fabricated of two or more pieces of glass, and one or more interlayers of plastic. Annealed, heat-treated, wired, tinted and reflective glass, one-way and two-way mirrors can be incorporated into laminated units. Laminated glass may be used as safety glazing material or may be used to improve acoustics of a building. The designer should consider loading and safety requirements when choosing types of glass used.**

**********

Laminated glass shall be 6 mm minimum thickness and consist of two layers of heat strenghtened glass. Glass shall be bonded together with [0.38] [0.76] [1.52] mm [0.015] [0.030] [0.060] inch thick PVB interlayer under pressure, or alternatives such as resin laminates, conforming to requirements of 16 CFR 1201 and ASTM C 1172. Color shall be clear.

## 2.7 SPANDREL GLASS

### 2.7.1 Ceramic-Opacified Spandrel Glass

Ceramic-opacified spandrel glass shall be kind HS heat-strengthened transparent flat type, Condition B, coated with a colored ceramic material on No. 2 surface, Quality q3 - glazing select, conforming to ASTM C 1048. Glass performance shall be K-Value/Winter Nighttime [_____],R-Value/Winter Nighttime [_____], shading coefficient [_____]. Color shall be [_____] [as shown in Section 09915 COLOR SCHEDULE].

## 2.9 MIRRORS

**********

**NOTE: Select the frames (J-Mold channels) or clips to secure mirror to wall. Mastic is required with each type of installation. Mirror sizes will be shown on the drawings. Coordinate with Section 05500 MISCELLANEOUS METAL and Section 10800 TOILET ACCESSORIES to ensure that frames are specified for these mirrors.**

**One-way vision glass should be used for psychiatric and security observation windows. Where safety glazing is required, specify either laminated glass or tempered glass.**
**********

2.9.1 Glass Mirrors

Glass for mirrors shall be Type I transparent flat type, Class [1-clear] [2-tinted], Glazing Quality q1 6 mm (1/4 inch) 1/4 inch thick conforming to ASTM C 1036. Glass color shall be [[clear] [bronze] [gray] [_____]] [as shown in Section 09915 COLOR SCHEDULE]. Glass shall be coated on one surface with silver coating, copper protective coating, and mirror backing paint. Silver coating shall be highly adhesive pure silver coating of a thickness which shall provide reflectivity of 83 percent or more of incident light when viewed through 6 mm (1/4 inch)1/4 inch thick glass, and shall be free of pinholes or other defects. Copper protective coating shall be pure bright reflective copper, homogeneous without sludge, pinholes or other defects, and shall be of proper thickness to prevent "adhesion pull" by mirror backing paint. Mirror backing paint shall consist of two coats of special scratch and abrasion-resistant paint , and shall be baked in uniform thickness to provide a protection for silver and copper coatings which will permit normal cutting and edge fabrication.

2.9.3 Mirror Accessories

2.9.3.1 Mastic

Mastic for setting mirrors shall be a [polymer] [_____] type mirror mastic resistant to water, shock, cracking, vibration and thermal expansion. Mastic shall be compatible with mirror backing paint, and shall be approved by mirror manufacturer.

2.9.3.2 Mirror Frames

Mirrors shall be provided with mirror frames (J-mold channels) fabricated of one-piece roll-formed Type 304 stainless steel with No. 4 brushed satin finish and concealed fasteners which will keep mirrors snug to wall. Frames shall be 32 x 6 x 6 mm (1-1/4 x 1/4 x 1/4 inch) 1-1/4 x 1/4 x 1/4 inch continuous at top and bottom of mirrors. Concealed fasteners of type to suit wall construction material shall be provided with mirror frames.

2.9.3.3 Mirror Clips

Concealed fasteners of type to suit wall construction material shall be provided with clips.

2.11 GLAZING ACCESSORIES

2.11.1 Preformed Tape

Preformed tape shall be elastomeric rubber extruded into a ribbon of a width and thickness suitable for specific application. Tape shall be of

type which will remain resilient, have excellent adhesion, and be chemically compatible to glass, metal, or wood.

2.11.2 Sealant

Sealant shall be elastomeric conforming to ASTM C 920, Type S or M, Grade NS, Class 12.5, Use G, of type chemically compatible with setting blocks, preformed sealing tape and sealants used in manufacturing insulating glass. Color of sealant shall be [[as selected] [_____]] [as shown in Section 09915 COLOR SCHEDULE].

2.11.3 Glazing Gaskets

Glazing gaskets shall be extruded with continuous integral locking projection designed to engage into metal glass holding members to provide a watertight seal during dynamic loading, building movements and thermal movements. Glazing gaskets for a single glazed opening shall be continuous one-piece units with factory-fabricated injection-molded corners free of flashing and burrs. Glazing gaskets shall be in lengths or units recommended by manufacturer to ensure against pull-back at corners. Glazing gasket profiles shall be as indicated on drawings.

2.11.3.1 Fixed Glazing Gaskets

Fixed glazing gaskets shall be closed-cell (sponge) smooth extruded compression gaskets of cured elastomeric virgin neoprene compounds conforming to ASTM C 509, Type 2, Option 1.

2.11.3.2 Wedge Glazing Gaskets

Wedge glazing gaskets shall be high-quality extrusions of cured elastomeric virgin neoprene compounds, ozone resistant, conforming to ASTM C 864, Option 1, Shore A durometer between 65 and 75.

2.11.3.3 Aluminum Framing Glazing Gaskets

Glazing gaskets for aluminum framing shall be permanent, elastic, non-shrinking, non-migrating, watertight and weathertight.

2.11.4 Putty and Glazing Compound

Glazing compound shall conform to ASTM C 669 for face-glazing metal sash. Putty shall be linseed oil type conforming to CID A-A-378for face-glazing primed wood sash. Putty and glazing compounds shall not be used with insulating glass or laminated glass.

2.11.5 Setting and Edge Blocking

Neoprene setting blocks shall be dense extruded type conforming to ASTM D 395, Method B, Shore A durometer between 70 and 90. Edge blocking shall be Shore A durometer of 50 (+ or - 5). Silicone setting blocks shall be required when blocks are in contact with silicone sealant. Profiles, lengths and locations shall be as required and recommended in writing by glass manufacturer.

## PART 3 EXECUTION

### 3.1 PREPARATION

Openings and framing systems scheduled to receive glass shall be examined for compliance with approved shop drawings, GANA Glazing Manual and glass manufacturer's recommendations including size, squareness, offsets at corners, presence and function of weep system, face and edge clearance requirements and effective sealing between joints of glass-framing members. Detrimental materials shall be removed from glazing rabbet and glass surfaces and wiped dry with solvent. Glazing surfaces shall be dry and free of frost.

### 3.2 INSTALLATION

Glass and glazing work shall be performed in accordance with approved shop drawings, GANA Glazing Manual, glass manufacturer's instructions and warranty requirements. Glass shall be installed with factory labels intact and removed only when instructed. Wired glass and fire/safety rated glass shall be installed in accordance with NFPA 80. Edges and corners shall not be ground, nipped or cut after leaving factory. Springing, forcing or twisting of units during installation will not be permitted.

### 3.3 CLEANING

Upon completion of project, outside surfaces of glass shall be washed clean and the inside surfaces of glass shall be washed and polished in accordance with glass manufacturer's recommendations.

### 3.4 PROTECTION

Glass work shall be protected immediately after installation. Glazed openings shall be identified with suitable warning tapes, cloth or paper flags, attached with non-staining adhesives. Reflective glass shall be protected with a protective material to eliminate any contamination of the reflective coating. Protective material shall be placed far enough away from the coated glass to allow air to circulate to reduce heat buildup and moisture accumulation on the glass. Glass units which are broken, chipped, cracked, abraded, or otherwise damaged during construction activities shall be removed and replaced with new units.

-- End of Section --